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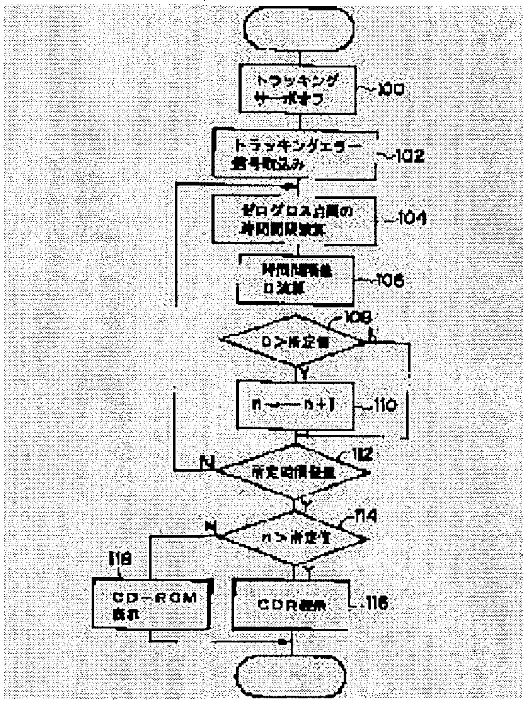
(54) REPRODUCER FOR OPTICAL INFORMATION RECORDING MEDIUM



(57)Abstract:

PROBLEM TO BE SOLVED: To discriminate the type of an optical information recording medium by a simple structure.

SOLUTION: When a reproducing operation is started, a tracking servo is turned OFF (100), a tracking error signal is taken in (102), judgement is made as to whether a time interval difference D between zero crossing points is equal to a specified value or higher (108), judgement is made as to whether the rate of the time interval difference D equal to the specified value or higher is large or not (114), and judgement is made as to the superposing of wobbling detecting signal on the tracking error signal. If the superposing of the wobbling signal is judged, a recording medium is judged as a CD-R (116), and if the superposing of the wobbling signal is not judged, a recording medium is judged as CD-ROM (118).

LEGAL STATUS

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CLAIMS

[Claim(s)]
[Claim 1] The regenerative apparatus of an optical information record medium including an on-off means to turn a tracking servo on and off, and a judgment means to judge whether the tracking error signal or the playback RF signal is overlapped on the wobble detecting signal by the tracking servo OFF state, and to judge the class of optical information record medium.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the regenerative apparatus of an optical information record medium, and relates to the regenerative apparatus of the optical information record medium which reproduces the information especially recorded on the optical information record medium only for playbacks like CD-ROM and DVD-ROM and CD-R, CD-RW, DVD-R, and the optical information record medium in which record like DVD-RAM is possible.
[0002]
[Description of the Prior Art] The wobble groove in which it moved for making linear velocity of a disk regularity at the time of record and playback in a zigzag direction is formed in CD-R, CD-RW, DVD-R, and a recordable optical information record medium (recordable record medium) like DVD-RAM. In case the information recorded on such a recordable record medium is reproduced, in order to carry out tracking using a wobble groove, a tracking error signal is overlapped on the meandering signal according to a wobble groove, and as shown in drawing 3 (A), the amplitude of a tracking error signal becomes large. In addition, drawing 3 (A) is a tracking error signal in the tracking servo ON state at the time of playback of CD-R which is a recordable record medium, and drawing 3 (B) is a tracking error signal in the tracking servo OFF state at the time of playback of CD-R. Moreover, drawing 4 (A) is a tracking error signal in the tracking servo ON state before record of CD-R, and drawing 4 (B) is a tracking error signal in the tracking servo OFF state before record of CD-R.
[0003] On the other hand, since the wobble groove is not formed in CD-ROM which is an optical information record medium only for playbacks (record medium only for playbacks), as a tracking error signal is not overlapped on a meandering signal and it is shown in drawing 5 (A), the amplitude of the tracking error signal of a tracking servo ON state becomes smaller than the tracking error signal of drawing 3 (A). In addition, drawing 5 (B) is the tracking error signal of a tracking servo OFF state.
[0004] Therefore, in the regenerative apparatus which reproduces both a recordable record medium and the record medium only for playbacks, it can distinguish whether the medium for playback is a recordable record medium, or it is a record medium only for playbacks by judging the magnitude of the amplitude of whether the tracking error signal is overlapped on the meandering signal, and a tracking error signal.
[0005] However, when only one of tracking error signals is outputted by the abnormalities of a regenerative apparatus etc., there is a problem of it becoming impossible to distinguish the class of optical information record medium.
[0006] This invention was made in order to cancel the above-mentioned trouble, and it aims at offering the regenerative apparatus of the optical information record medium equipped with the function which distinguishes the class of optical information record medium.
[0007]
[Means for Solving the Problem] In order to attain the above-mentioned purpose, the regenerative apparatus of the optical information record medium of claim 1 is constituted including an on-off means

to turn a tracking servo on and off, and a judgment means to judge whether the tracking error signal or the playback RF signal is overlapped on the wobble detecting signal by the tracking servo OFF state, and to judge the class of optical information record medium.

[0008] When it is the optical information record medium with which the wobble groove is formed, a tracking error signal and a playback RF signal are overlapped on a wobble detecting signal by the tracking servo OFF state. On the other hand, when it is the optical information record medium with which the wobble groove is not formed, a tracking error signal and a playback RF signal are not overlapped on a wobble detecting signal by the tracking servo OFF state. Therefore, the class of optical information record medium can be distinguished by judging whether the tracking error signal or the playback RF signal is overlapped on the wobble detecting signal.

[0009] In this invention, since the class of optical information record medium is distinguished by the tracking servo OFF state, when the tracking error signal of a tracking servo ON state becomes unusual, the class of optical information record medium can be distinguished.

[0010]

[Embodiment of the Invention] The gestalt of operation of this invention which applied this invention to the regenerative apparatus which reproduces CD-ROM and CD-R with reference to a drawing hereafter is explained to a detail.

[0011] As shown in drawing 1 , the optical pickup 12 which consisted of semiconductor laser and two or more photodetectors is arranged at the rear-face side of the disk 10 which is an optical information record medium. The output signal of the photodetector of an optical pickup 12 is inputted into the RF amplifier section 14 equipped with the focal error signal generation circuit and the tracking error signal generation circuit.

[0012] The focal error signal generated in this RF amplifier section 14 is inputted into the servo control circuit 16. Moreover, the tracking error signal outputted from the tracking error signal generation circuit is inputted into the disk judging circuit 20 which consisted of the A/D converters and microcomputers which change an analog signal into a digital signal while it is inputted into the servo control circuit 16. In the disk judging circuit 20, the class of disk which changes a tracking error signal into a digital signal, inputs into a microcomputer, and has become a candidate for playback with the A/D converter is judged.

[0013] The servo control circuit 16 performs the tracking servo and focus servo of an optical pickup 12 according to the tracking error signal and the focal error signal which were inputted. This servo control circuit 16 also performs the control of the delivery motor 22 for which an optical pickup 12 is moved to a predetermined location, and the roll control of the spindle motor 24 made to rotate a disk 10. Actuation of this servo control circuit 16 is controlled by the system controller 26.

[0014] Moreover, while the playback RF signal obtained by the RF amplifier section 14 is inputted into the decoder (DEC) 28 of EFM (Eight toFourteen Modulation) and CIRC (Cross Interleave Reed-Solomon Cord) and recovery processing is performed, error correction processing is performed. The compression coded data by which the error correction was carried out is temporarily memorized by DRAM32 through a memory controller 30 by this decoder 28. The compression coded data memorized by this DRAM32 is read one by one by control of a memory controller 30, is supplied to a decoder 34 through a memory controller 30, and expanding decryption processing is performed. And the digital audio data outputted from a decoder 34 are supplied to a digital-to-analog converter (D/A converter) 34, and it is output audio signal SAout from an output terminal 36. It is outputted.

[0015] Moreover, the drop 40 which displays the condition of the operating procedure by the actuation key section 38 and this actuation key section 38 for a user to perform various actuation and a system etc. is connected to the system controller 26.

[0016] Next, the judgment routine which judges the class of disk performed with reference to drawing 2 in a disk judging circuit is explained. If the power source of a regenerative apparatus is turned on, rotation of a spindle motor, luminescence of laser, a focus servo, etc. will be performed, playback actuation will be started, and a tracking servo will be turned OFF in step 100. At step 102, the time interval of a zero crossing point is calculated from the detection time of day of the zero crossing point

which incorporated the tracking error signal by which digital conversion was carried out, detected the zero crossing point of tracking error ****** in step 104, and was detected this time, and the detection time of day of the zero crossing point detected last time.
[0017] Drawing 6 (A) shows change of the time interval of the zero crossing point of the tracking error signal in the tracking servo OFF state of CD-ROM, and drawing 6 (B) shows the differential D of the time interval of (A), i.e., the difference of a time interval. Moreover, drawing 7 (A) shows change of the time interval of the zero crossing point of the tracking error signal in the tracking servo OFF state of recorded CD-R, and drawing 7 (B) shows the difference D of the time interval of (A). So that I may be understood from drawing the difference D of the time interval in the case of CD-ROM Except for the case where it changes from not being superimposed on the wobble detecting signal which is a meandering signal according to a wobble groove a lot, it is abbreviation regularity. The difference D of the time interval in the case of recorded CD-R ****** fluctuation of the case where it changes from being superimposed on the wobble detecting signal a lot is carried out, and playback of CD-ROM and playback of recorded CD-R can be distinguished from the difference D of this time interval.
[0018] Then, in step 106, the difference D of the time interval of a zero crossing point is calculated, and the difference D of a time interval judges whether it is beyond a predetermined value in step 108. When the difference D of a time interval is beyond a predetermined value, in step 110, counted value n is incremented one time, and it judges whether predetermined time progress was carried out at step 112. And when having not carried out predetermined time progress, it returns to step 114 and the above-mentioned processing is repeated.
[0019] When predetermined time progress is carried out, in step 114, counted value n judges whether it is beyond a predetermined value, and it is judged that it is superimposed on the wobble detecting signal at the time beyond a predetermined value since the rate that the difference D of a time interval is beyond a predetermined value is high.
[0020] Since it is the case where the wobble is formed in the disk for playback when it is judged that the tracking error signal is overlapped on the wobble detecting signal at step 114, it expresses that CD-R is by the disk for playback to a display 40 as step 116.
[0021] Since it is the case where the wobble is not formed in the disk for playback, on the other hand when it is judged that a tracking error signal is not overlapped on the wobble detecting signal at step 114, it displays that CD-ROM is a disk for playback on step 118 display 40.
[0022] By the way, when the software file to which the copy originally is not permitted tends to be recorded on an optical information record medium (CD-R) and it is going to reproduce with a false tracking error signal, it is judged with CD-R by the judgment routine of the gestalt of the above-mentioned operation. Therefore, it can judge whether the optical information record medium with which the software file to which the copy originally is not permitted was recorded is reproduced using the above-mentioned judgment judging routine, and activation (playback and program execution) of the software of the optical information record medium with which the software file to which the copy originally is not permitted was recorded can be prevented.
[0023] In addition, although the regenerative apparatus which reproduces CD-ROM and CD-R above was explained, it is applicable also to CD-ROM, CD-RW, DVD-R, and the regenerative apparatus that reproduces DVD-RAM.
[0024]
[Effect of the Invention] The effectiveness that the optical information record medium for playback can distinguish whether it is an optical information record medium only for playbacks and whether it is a recordable optical information record medium with an easy configuration according to this invention even if a tracking error signal is unusual as explained above is acquired.

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is the block diagram of the gestalt of operation of this invention.
[Drawing 2] It is the flow chart showing the judgment routine which judges the class of disk of the gestalt of this operation.
[Drawing 3] (A) is the wave form chart showing the tracking error signal of the tracking servo ON state of CD-R after record, and (B) is the wave form chart showing the tracking error signal of the tracking servo OFF state of CD-R after record.
[Drawing 4] (A) is the wave form chart showing the tracking error signal of the tracking servo ON state of CD-R before record, and (B) is the wave form chart showing the tracking error signal of the tracking servo OFF state of CD-R before record.
[Drawing 5] (A) is the wave form chart showing the tracking error signal of the tracking servo ON state of CD-ROM, and (B) is the wave form chart showing the tracking error signal of the tracking servo OFF state of CD-ROM.
[Drawing 6] The diagram showing the time interval of the zero crossing point of a tracking error signal [in / in (A) / the tracking servo OFF state of CD-ROM] and (B) are the diagrams showing the differential of the time interval of (A).
[Drawing 7] The diagram showing the time interval of the zero crossing point of a tracking error signal [in / in (A) / the tracking servo OFF state of recorded CD-R] and (B) are the diagrams showing the differential of the time interval of (A).
[Description of Notations]
12 Disk
16 Servo Control Circuit
20 Disk Judging Circuit

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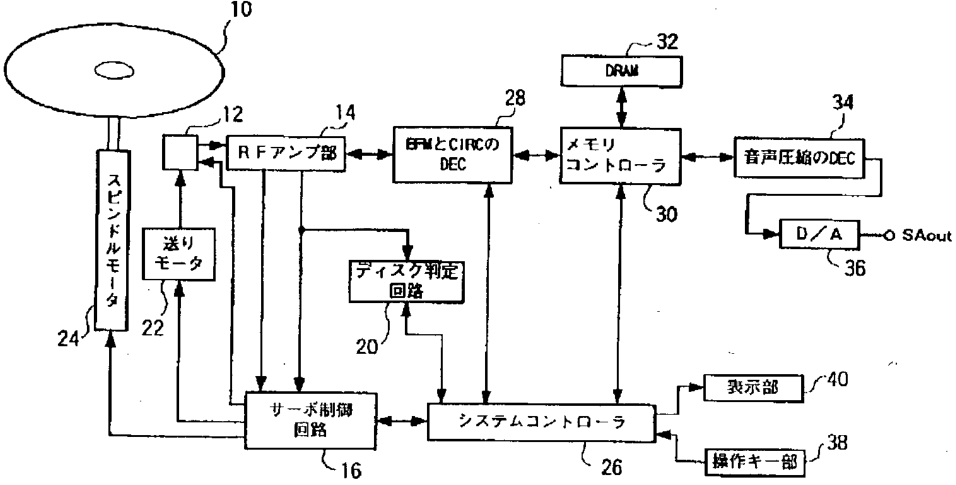
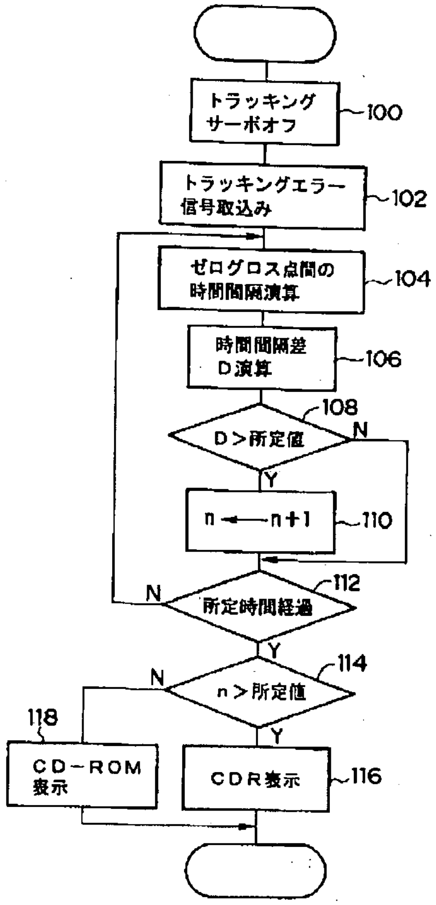
DRAWINGS

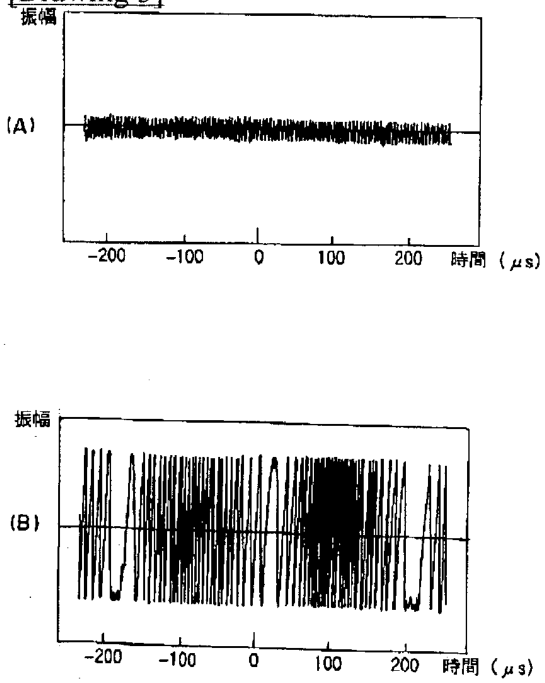
[Drawing 1]


10
32
DRAM
28
34
12
14
RFアンプ部
EFMとCIRCの DEC
メモリ コントローラ
音声圧縮のDEC
30
D／A
SAout
36
スピンドルモータ
送り モータ
ディスク判定 回路
24
22
20
サーボ制御 回路
システムコントローラ
表示部
40
操作キー部
38
16
26

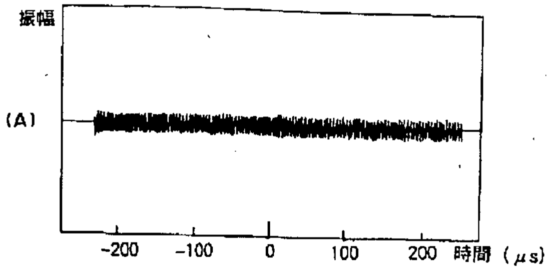
[Drawing 2]

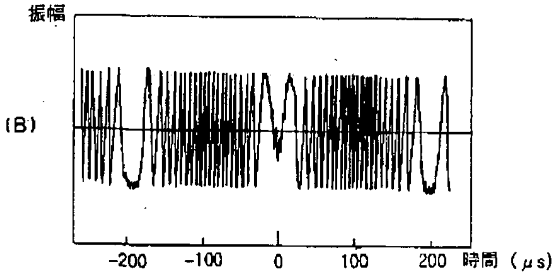

トラッキング
サーボオフ
100
トラッキングエラー
信号取込み
102
ゼログロス点間の
時間間隔演算
104
時間間隔差
D演算
106
108
D＞所定値
N
Y
n ← n+1
110
112
N
所定時間経過
Y
114
N
n＞所定値
Y
118
CD－ROM
表示
CDR表示
116

[Drawing 3]

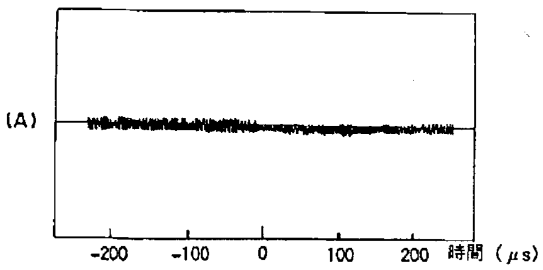


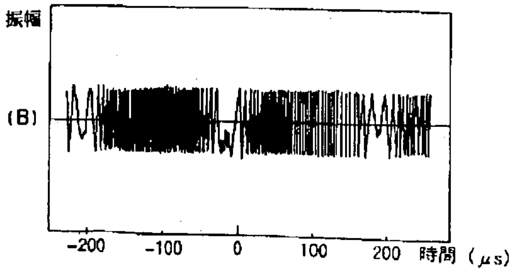
[Drawing 4]





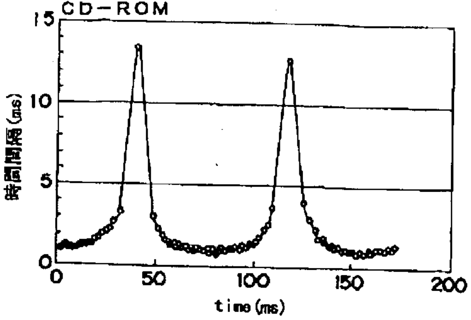
[Drawing 5]



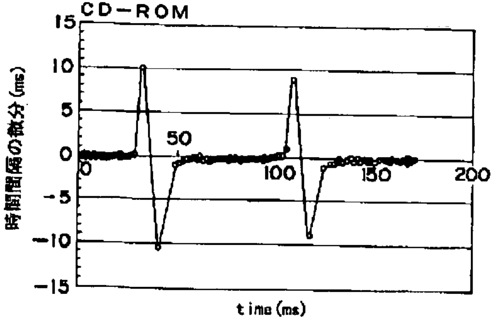


[Drawing 6]

(A)
ゼロ点からゼロ点迄の時間間隔

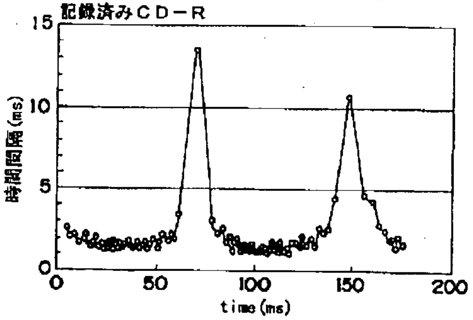


(B)
上図の微分

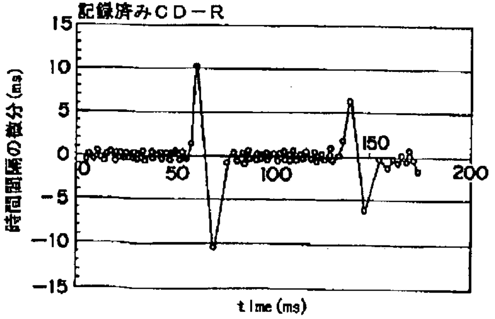


[Drawing 7]

(A)
ゼロ点からゼロ点迄の時間間隔



(B)
上図の微分



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